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Editorial

PLANTS IN HEALTHCARE: PAST, PRESENT AND FUTURE

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ABSTRACT: Plants have been used as medicines or sources of medicines from a very ancient stage of human civilization. In the ancient days, the collected plant parts were used directly or in dried and preserved conditions. Afterward, the dried parts of the medicinal plants were used as medicine as single or poly-herbal mixtures with or without vehicle as used in present-day Ayurveda and alike medical systems. In homeopathy, the ethanol extracts of dried plant parts are used. Identification of active principles from the extracts of the dried plant parts has made the basis of laboratory synthesis of many drugs of modern medicine. Some novel types of healthcare techniques are proposed for further validation. Following a diet containing selected herbal foods (DIP diet) in an unprocessed state along with a change in lifestyle can control many diseases. Fruit pulp, fruit juice and other related food products can be prepared by using only herbal plant parts and also can be supplied without the addition of any synthetic chemicals. Similarly, medicines prepared from the succulent parts of the medicinal plants can effectively be used to prevent and cure many diseases. All these can be performed following some novel procedures of collection, chemical-free processing, packaging, storage, and transportation to the patients and consumers.

Key words: Herbal medicine, Active principle, DIP diet, Succulent biomedicine.

HISTORY OF USE OF PLANTS AS MEDICINE

Plants have been used in healthcare from a very early stage of human civilization. The Neanderthals burial site (60000 years ago) (Solecki 1975), belongings of Ötzi the Iceman of 5000 years ago (Capasso 1998) etc. are some ancient examples where medicinal plant parts were found with the human. Among the written documents, the oldest one was found on a Sumerian clay slab of almost 5000 years old (Petrovska 2012). Other ancient pieces of evidence found were in the Chinese book "Pen TS'ao," written by Shen Nung of 2500 BC, in Egyptian Ebers Papyrus of 1550 BC (Petrovska 2012), Indian Ayurvedic medicine documented in the Vedas and Sushruta Samhita between 1500 – 500 BC (Aggarwal *et al.* 2007, Dwivedi and Dwivedi 2007), in Homer's epics - the Iliad and the Odysseys of 800 BC, in the works of Hippocrates of 459-370 BC, Dioscorides (considered as the father of Pharmacology) in his book "De Materia Medica of 77 AD (Petrovska 2012) etc.

On our planet, there are about 374,000 estimated plant species, of which 308,312 are vascular plants which include 295,383 flowering plants (Christenhusz and Byng 2016). India is among the leading biodiversity centers of the world for holding over 45,000 different plant species (Asthana *et al.* 2012). Out of 15000-17000 medicinal plants, about 3000 – 7500 species are used traditionally for medicinal purposes (Meena *et al.* 2009, Pattanayak 2012). Among the Indian traditional systems, Ayurveda (700), Unani (700), Siddha (600), and Amchi (600) are the main users of medicinal plants for therapeutic purposes (Rabe and Staden 1997). In Homeopathy, over 800 species of plants are used (Bharatan 2008).

The use of plants directly for medicinal purposes is not only a practice of the past. Even today, several ethnic and rural people use medicinal plants for their healthcare throughout the globe. As per WHO estimate, almost 80 percent of the world population depends mainly on traditional medicines, a large part of which is of herbal origin (Farnsworth 1985). The main reasons behind such widespread use of plant resources in healthcare are local availability and limited access to modern medicines (Pattanayak *et al.* 2012).

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RESEARCH ON THE USE OF PLANTS AS MEDICINE

A. Documentation of medicinal uses of plants

i) Documentation in the ancient era

During the ancient days, the use of the plants for different medicinal purposes was either not documented and the knowledge was passed for generations from the medicine men/women to their disciples or documented in some cases by local names (Sen and Sen 2005). With the passage of time, and with changes of the colloquial languages, such vernacular plant names have also changed. So, information about many important medicinal plants may have also been lost or not available now or the plant may also be extinct or non-identifiable at the present time (Sen and Sen 2005, Pattanayak 2012).

After the introduction of the scientific techniques of nomenclature for all the living species of our planet (plants, animals, etc.) by Carolus Linnaeus (1707 - 1778), the scientific nomenclature of the plants was started replacing local or colloquial names and the old or traditional uses of the plants are also documented afterward using these internationally accepted names (Pearson 2003).

Identification of actual plants from the ancient documented names and descriptions by analysis of different related points along with infield study of the said living plant species following scientific procedures and collection of information regarding their medicinal uses from the ancient texts and literature are very much important. Along with available documented ethnomedicinal reports, infield surveys to collect further information from the medicine men and medicine women as well as other rural people etc. made the platform of that study far more diverse and important.

ii) Recent trends in documentation

The early documentation works were performed either by plant Family-wise (as all the effective plants of a Family were listed with their reported uses) or individually without following any such system. In India, many early epic works of high significance have actually formed the basis for the works at a later stage (The wealth of India 1949, Chopra *et al.* 1956, Uphof 1968) and also a brief description of some selected important medicinal plants in the edited book by Ambasta (1986).

During the last few years, documentation of the use of medicinal plants as per their activity of a certain type has been observed. Plants used for the protection of some organ or organ-system are available to us from those pieces of literature (Pattanayak *et al.* 2016a, Pattanayak *et al.* 2016c, Nirumand *et al.* 2018). Reports on the use of medicinal plants in different geographical areas have also provided important information and enriched our knowledge base (Kutalek and Prinz 2005, Pattanayak *et al.* 2015a, Pattanayak *et al.* 2015b).

Another important type of cataloging of plants has been done based on possible medicinal activities of plants on the body systems by dietary use in their raw form to serve definite purposes. The use of the medicinal plants in a definite therapeutic purpose based on the systemic effects of all the nature-gifted phytochemicals inside them is the target of these studies. Such documentations are analytical in nature and can act as ready references for initiating research to validate their abilities as medicines. Use of plants against infectious diseases (Pattanayak 2019a, Khameneh *et al.* 2019, Pattanayak 2019b), as immunomodulators and body system-modifier to control different diseases (Pattanayak 2020, Pattanayak 2021), etc. are examples.

A. Contemporary research on medicinal activities of plants

i) Ayurveda and other similar systems of medicine

Ayurveda is considered the science of life with a holistic approach to health and personalized medicine. It is one of the oldest medicines containing thousands of medical concepts and hypotheses. Many people trust the ability of this system to treat different diseases such as cancer, asthma, diabetes, etc. which are not easily treatable in modern medicine (Chauhan *et al.* 2015).

Dry parts of the medicinal herbs singly or as polyherbal formulations are generally used in Ayurveda. The dry medicinal parts of the plants are generally converted to smaller parts and used with or without a vehicle, covered by capsules in a few cases (as soft gel capsules or hard capsules) in Ayurveda and many other similar traditional systems of medicines. In a few cases, some other type of uses of medicinal parts of plants is also practiced (such as decoction of herbal parts, use of essential oils, use of vapors etc.).

In the present day, research is mainly targeted to validate the activities documented in the various medical texts of Ayurveda and other similar systems in the eyes of modern science by using currently available research tools and techniques (Meena *et al.* 2009, Chauhan *et al.* 2015). So, research in Ayurveda is mainly targeted in the fields of collection of information from ancient literature, fundamental uses, understanding of the drugs as well as research on their pharmaceutical and clinical research activities (Chauhan *et al.* 2015).

ii) Homeopathy

In Homeopathy, alcoholic (ethyl alcohol generally) extracts of dry parts of medicinal plants at different levels of dilutions are generally used as medicines. Research on the collection of information and clinical trials is given much importance in Homeopathic medicine. The broad research activities in Homeopathy are - survey, collection, and cultivation of medicinal plants, standardization of drugs, proving of activities of the drugs, clinical verification of drugs, and clinical research on Homeopathic drugs (CCRH 2018).

iii) Modern medicine

In modern medicine, research is mainly conducted towards the development of marketable synthetic or semi-synthetic medicines using plants as some source (Pattanayak *et al.* 2016b).

For the development of a new drug, validation of traditional claims or other literature reports is performed as the first step. Different solvent (such as methyl alcohol, ethyl alcohol, acetone etc.) extracts of the dry parts of the medicinal plants are studied for their reported activities. If any fraction of the solvent extract shows the desired activity, studies are performed to identify the effective (active) principle(s) involved in such activity. Then further studies are conducted on laboratory synthesis of structural analogs of such active principles, determination of their dose and toxicity before marketing of the active drug as medicine (Pattanayak *et al.* 2016b, Pattanayak 2018, Khameneh *et al.* 2019).

B. Emerging windows of development of therapeutics from herbal origin

As a part of the modern lifestyle, people are becoming dependent more and more on processed foods and foods added with different synthetic chemicals. The cumulative effects of all such synthetic chemicals taken regularly may have serious impacts on our health (Pattanayak 2017). So, following an alternative to such dependence on the use of synthetic chemicals in food and medicine may reduce the bio-burden of chemicals and so the chance of development of several diseases.

Apart from the different contemporary systems of medicine involving the use of dry parts or their extracts of different nature to control and cure diseases, some new concepts are emerging in the area of use of plants as some biomedicines. Two main systems can be discussed under this category which are interrelated and may be considered as having relation with the Indian traditional healthcare system, Ayurveda. These two sections are advocated along with following the desired lifestyle involving ample daily physical exercise, restriction in some unhealthy activities, living without any narcotics or alcohol, following tension-free life etc. Among these two, one focuses on eating fruits, vegetables and nuts as a major part of the diet, eating of preservatives and all other added chemical-free fruit, fruit juice, ice cream, etc.; use of skincare, haircare, etc. preparations made solely from herbs without the addition of any synthetic chemicals, etc. The other one is the therapeutic use of parts of the medicinal plants at their succulent stages.

i) Novel concepts of use of unaltered herbal parts as food and healthcare

a) The DIP diets

"The disciplined and intelligent peoples' diet" (DIP diet) is mainly a plant-based diet plan with some protocols for breakfast, lunch, dinner etc. The fruits and nuts listed for use under this diet plan are to be taken in their raw, succulent form. It is claimed that people can stay away from diseases like high blood pressure, diabetes, thyroid problems, kidney diseases, arthritis, liver disease, cancers, obesity etc. by practicing this diet plan (Roy Chowdhury 2021).

A study was conducted on 55 diabetic persons kept on a selected raw fruit and vegetable diet for three days within some lifestyle restrictions. Among them, 84% of patients showed marked improvements, and 16% of patients showed moderate improvement in their blood glucose levels as a result of the diet and lifestyle modifications (Roy Chowdhury 2017).

b) Use of fruit products, herb made skin-hair care products, etc. without any synthetic chemical

A novel collection, packaging and transportation system are proposed for fruit pulp, fruit juices, other related products like fruit ice creams; skincare, hair care products, etc. of completely herbal origin. Following the described procedures, medicinal parts of the plants are to be collected, encapsulated, or packed without the use of any synthetic chemicals (like synthetic preservatives, stabilizers, etc.) and can be transported throughout the globe under a framed cold chain system (Pattanayak 2019b).

ii) Succulent biomedicines

The term succulent biomedicine is given to the paste, juice, or seed-powder of relevant parts of different medicinal plants collected as well as used in the succulent state. In this novel system of medicine, uses of synthetic chemicals are avoided at all the steps of preparation, encapsulation, packaging, storage and transportation of

the medicines. This system is framed with some defined steps. After validation of their activities in succulent forms, the medicinal plant parts are to be collected in their succulent conditions from the area of their cultivation. Then after standardization of dose and performing toxicity studies, these can be mixed with bio-preservatives and then may be capsulated by bio-encapsulating materials, if required. Finally these are to be transported to patients throughout the globe and can be stored by the retailers under some specially designed cold chain facilities (Pattanayak 2020, Pattanayak 2021). As the succulent parts of the medicinal plants contain almost all the phytoconstituents present in the living plants, it is natural that they can show the highest level of activities in that form. In all other systems of medicine where the dry parts of the plants or their extracts are used have the limitation of presentation of only one or a few phytochemicals of the medicinal plant parts (Pattanayak *et al.* 2016b).

CONCLUSION

Plants and animals are two important entities of nature. Most animal species take plants as part of their diet. Many of the ape species take parts of plants for health benefits. The ancient people perhaps had a similar type of habit. But possibly due to problems in the storage of succulent plant parts and only seasonal or regional availability of fresh plants forced our predecessor to depend on the dried parts of the medicinal plants. Afterward, many systems were developed depending on the use of only the dry parts of the medicinal plants as medicines.

As the problem of preservation is not relevant at the present time and since many important phytochemicals are either reduced or lost in the dried or processed fruits, roots, or vegetable items, adoptive researches should be initiated for effective dietary use of succulent foods and succulent biomedicines. This can only lead to the development of different branches of the system, standardization of all related parameters, the establishment of herb-based medicine industries, and widespread application of the system for the benefit of mankind.

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